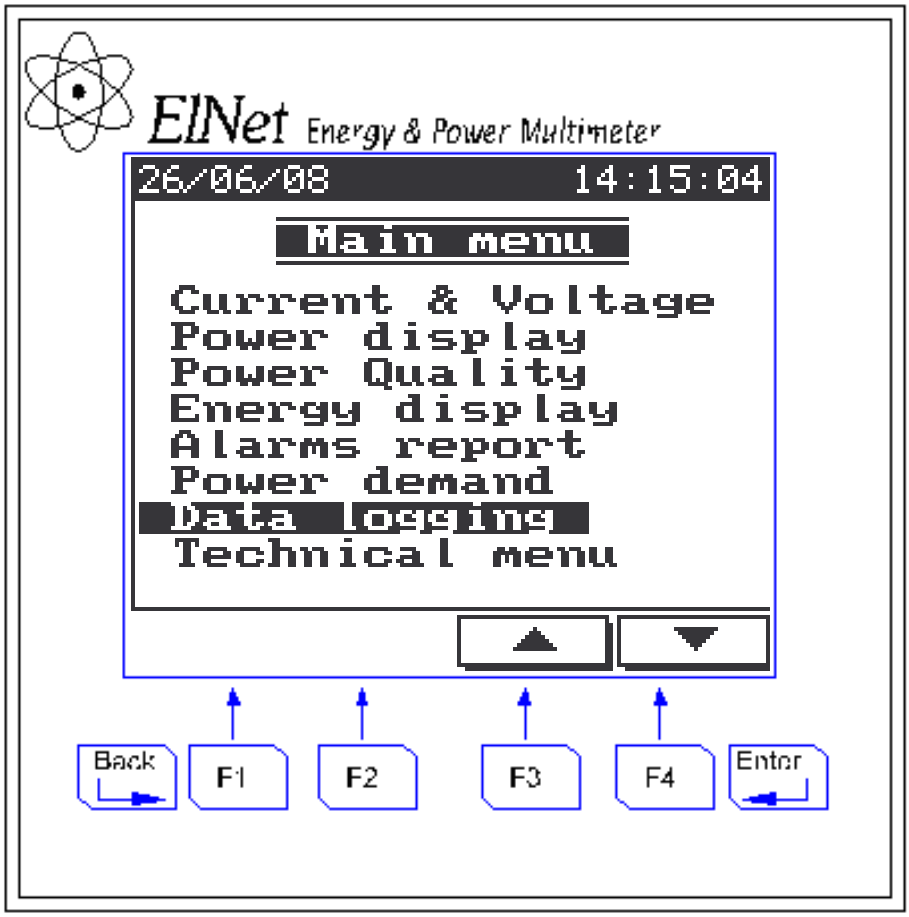


# Elnet GR

Electrical Measurements & Power Quality

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# CHAPTER 1 – INTRODUCTION

## 1.1 About the *ElNet* Multimeter

Large consumers of electricity e.g. factories, hotels, hospitals, municipalities, need to know the history of their consumption and the quality of the power supply. Details such as Voltage, Current, Power Factor, Hertz, Neutral Current, Energy Demands and all electricity related events are recorded in the ***ElNet*** Energy & Power Multimeter.

An additional feature of the Multimeter is the ability to measure Harmonics. Part of the Electricity Supply Authority's bill reflects poor or good Harmonics in the consumer's system, therefore it is in his interest to monitor Harmonics and try to improve it.

These are all recorded on a continual basis and can be recalled and shown on the front panel display of the instrument with a few simple key-strokes any time the user wishes.

The ***ElNet*** Energy & Power Multimeter is a compact, multi functional, three-phase Multimeter simple to install and is especially designed to integrate into Building Management Systems. It requires no special mounting and is ideally suited for mounting on the front face of any standard electrical panel.

The Configuration and Setup is menu driven, with password protection.

Communication with external devices is simple and is based on standard known technology.

The ***ElNet*** Energy & Power Multimeter boasts a new innovative built in "Flash Memory", which pioneers a new frontier into electrical measurement. It has a 1 MB of FLASH

MEMORY with a capacity of recording up to 2 years of power malfunctions and interruptions.

Readings, graphs, tables & history are shown on the graphic display of the ***ElNet*** Energy & Power Multimeter. This display is a state of the art screen with a resolution of 160X128.

Each ***ElNet*** Energy & Power Multimeter is carefully and meticulously manufactured using quality components and the latest production methods. Before leaving the factory each ***ElNet*** Energy & Power Multimeter is calibrated and sent to the customer accompanied by the test certificate and Certificate of Compliance (C.O.C).

## 1.2 How to use this manual

We at CONTROL APPLICATIONS Ltd, envisage this manual to be used by three types of people, i.e. the ***Installation Technician***, the ***Senior Electrical Engineer*** and the end ***User***. For this reason this manual is divided into chapters for ease of reference by each of these different people. There could be a situation where two of the abovementioned tasks can be combined, or in a rare instance one person could handle all three tasks.

CHAPTER 1, *Introduction*, describes the ***ElNet*** Energy & Power Multimeter, its potential users, the readings it can provide and some of its features in brief.

CHAPTER 2, *Installation,* provides detailed instructions for unpacking, mechanical mounting, and electrical wiring up instructions for the ***Installation Technician.***

CHAPTER 3, *Using the* ***ElNet*** Energy & Power Multimeter*,* describes in detail front Panel, the functions of the control buttons, and the Lock Utility.

CHAPTER 4, *Parameter Configuration & Settings* explains in detail the minimum parameters settings needed by the ***Senior Electrical Engineer*** to set up and configure the ***ElNet*** Energy & Power Multimeter.

CHAPTER 5, *Front Panel Displays,* is an easy to follow step-by-step guide to obtain readings, graphs, tables and histories for the ***User***.

CHAPTER 6, *Alarm reports* gives details about how to program the Alarms in the ***ElNet*** Energy & Power Multimeter.

CHAPTER 7, *Demand reports* is an easy to follow step-by-step guide to obtain the Demand reports up to 2 years.

CHAPTER 8, *Data Logging* is an easy to follow step-by-step guide to obtain all the stored peaks of current, voltage, energy, power factor etc. up to 2 years of data logging.

CHAPTER 9, *Communications* gives details about the Communication capabilities of the ***ElNet*** Energy & Power Multimeter, and how to Set Up.

CHAPTER 10, *Specifications,* is a detailed list of specifications of the ***ElNet*** Energy & Power Multimeter.

APPENDIX A, *Installation & Configuration Check List*, provides a Check List to insure no important steps will be missed during the initial set up.

## 1.3 Safety Information

The purpose of this manual is to help you. Please read the instructions carefully before performing any installation and note any precautions.

**WARNING**

- Ensure that all incoming AC power and other power sources are turned off before performing any work on the ***ElNet*** Energy & Power Multimeter. Failure to do so may result in serious or even fatal injury and/or equipment damage.
- If the ***ElNet*** Energy & Power Multimeter is damaged in any way do NOT connect it to any power source.
- To prevent a potential fire or shock hazard, never expose the ***ElNet*** Energy & Power Multimeter to rain or moisture.
- Keep the surrounding area free of dirt and clutter especially metal objects. Good housekeeping pays.
- Inspect the cables periodically for cracks, kinks or any other signs of wear
- Keep children away.
- Do not pull the cords.

- Users should stay alert and not approach the rear of the ***ElNet*** Energy & Power Multimeter while tired or under the influence of alcohol, medicines or any other chemical substance that would tend to make a person drowsy.
- Do not wear loose clothing or dangling jewelry.
- Above all use common sense at all times.

## 1.4 Warranty

CONTROL APPLICATIONS Ltd provides a 12- Month warranty against faulty workmanship or components from date of dispatch provided that the product was properly installed and used.

CONTROL APPLICATIONS Ltd does not accept liability for any damage that may be caused by natural disasters (such as floods, fire, earthquake, lightening etc.).

CONTROL APPLICATIONS Ltd does not accept liability for any damage that may be caused by malfunction of the ***ElNet*** Energy & Power Multimeter.

CONTROL APPLICATIONS Ltd will advise the customer on the proper installation and use of the ***ElNet*** Energy & Power Multimeter, but will not accept any responsibility that the instrument is suitable for the application for which it was originally purchased.

This warranty may become void if the Installation; Parameter Configuration & Setting Instructions are not carried out according to the instructions set out by CONTROL APPLICATIONS Ltd.

The ***ElNet*** Energy & Power Multimeter has no user serviceable parts and should be opened and serviced by a duly qualified authorized representative only. The sensitive electronics could become damaged if exposed to a static environment. This action would void the warranty.

This warranty is limited to the repair and/or replacement at CONTROL APPLICATION Ltd sole discretion of the defective product during the warranty period. Repaired or replaced products are warranted for ninety (90) days from the date of repair or replacement, or for the remainder of the original product's warranty period, whichever is longer.

CONTROL APPLICATIONS Ltd is always at your service to advise the customer on any problem that may be encountered regarding any installation, operation, parameter & configuration settings or maintenance.

## 1.5 Your comments are welcome

CONTROL APPLICATIONS Ltd. sincerely thanks you for choosing our ***ElNet*** Energy & Power Multimeter. We are confident that it will provide you with many years of trouble free service and give you all the power and energy information and history that you expected from the instrument when you bought it.

While every effort was made to keep the information as reliable, helpful, accurate and up to date as possible, all possible contingencies cannot be covered. Technical or typographical errors could occur, and we would be happy to receive any comments, criticisms or notifications of any such errors from you, our valued customer.

| | |
|---|---|
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| Electronic Address: | cal@ddc.co.il |

## 1.6 Disclaimer

Information in this User Manual is subject to change without notice and does not represent a commitment on the part of CONTROL APPLICATIONS Ltd.

CONTROL APPLICATIONS Ltd supplies this User Manual as is without warranty of any kind; either expressed or implied, and reserves the right to make improvements and/or changes in the manual or the product at any time.

While it is the intention of CONTROL APPLICATIONS Ltd to supply the customer with accurate and reliable information in this User Manual, CONTROL APPLICATIONS Ltd assumes no responsibility for its use, or for any infringement of rights of the fourth parties which may result from its use.

This User Manual could contain technical or typographical errors and changes are periodically made to the information herein; these changes may be incorporated in new editions of the publication.

# CHAPTER 2 — INSTALLATION

In this Chapter you will find the information and instructions that the ***Installation Technician*** needs to mount and connect the ***ElNet*** Energy & Power Multimeter

**WARNING!**

- During operation, hazardous voltages are present in connecting cables and terminal blocks.
- Fully qualified personnel must do all work. Failure to follow this rule may result in serious or even fatal injury to personnel and/or damage to equipment.
- Refer to Section 1.3 Safety information before carrying out any installation.
- Read this manual thoroughly and make sure you understand the contents before connecting the ***ElNet*** Energy & Power Multimeter to any power source.

## 2.1 Contents of packaging

The ***ElNet*** Energy & Power Multimeter is packed and shipped in a carton approximately 24.5 cm long X 19 cm wide X 12 and cm high.

Before opening the package, ensure the area, clean and dry.

Without using any sharp instruments, carefully open the carton of the ***ElNet*** Energy & Power Multimeter.

Please check the contents of the carton, it should contain:

1. Your new ***ElNet*** Energy & Power Multimeter.
2. ***ElNet GRAPHIC*** User Manual (this book).
3. Test Certificate and Certificate of Compliance (C.O.C).
4. A pair of Panel mounting clips.
5. 1 X two pole connector plugs
6. 1 X three pole connector plugs
7. 3 X Four pole connector plugs

## 2.2 Mechanical mounting

**To Mount the *ElNet* Energy & Power Multimeter**

**NOTE!**

Do not mount the ***ElNet*** Energy & Power Multimeter too close to any main electrical conductors.

Allow sufficient space to carry out maintenance to the back of the ***ElNet*** Energy & Power Multimeter

Choose a suitable location, and prepare a rectangular hole according to the dimensions shown in Figure 2.1

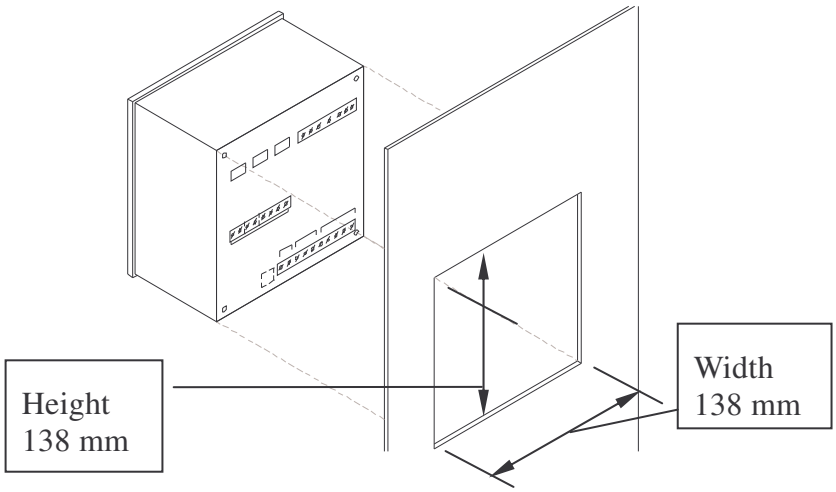



Figure 2.1. **Panel Cutout**

- Slide the ***ElNet*** Energy & Power Multimeter into the pre-prepared rectangular hole (ensure it is the right way up), then push the two mounting clips provided in the packaging into position. Use mild force to ensure the clips are securely positioned on the outer case of the ***ElNet*** Energy & Power Multimeter.
- Tighten the two mounting screws and ensure the ***ElNet*** Energy & Power Multimeter is firmly in place.

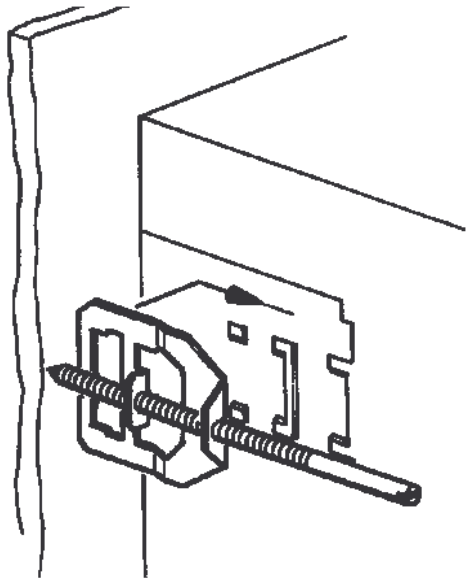


Figure 2.2. **Mounting Clips**

## 2.3 Wiring Schematics

**To wire up the *ElNet* Energy & Power Multimeter**

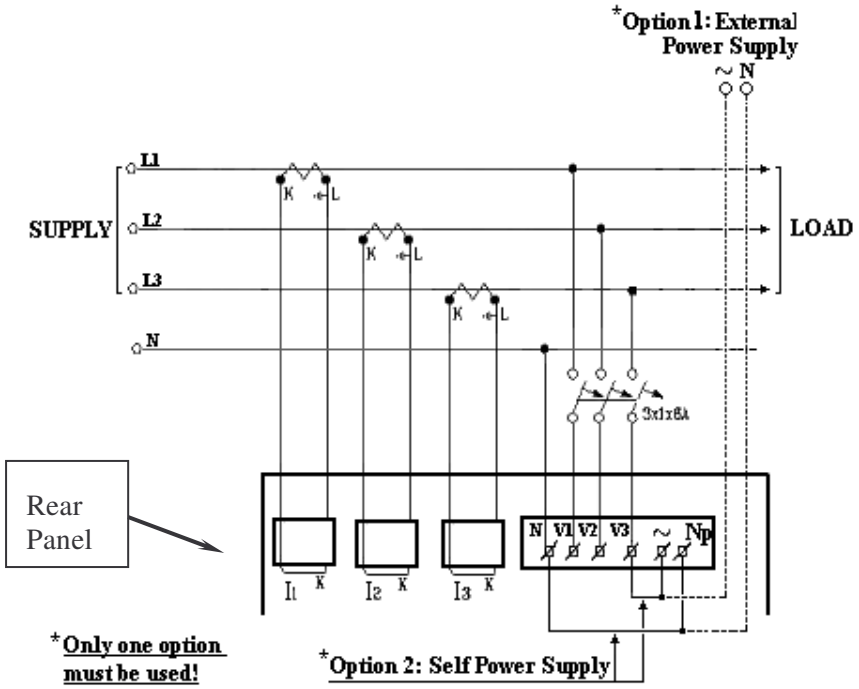



Figure 2.3. **Schematic Wiring Diagram**

## 2.4 Rear Panel Connections

**Please re-read section 1.3 for safety instructions**.

**To connect the Rear Panel**

All Connections, except those to the CT core of the ***ElNet*** Energy & Power Multimeter are made via terminal connector plugs (Voltage input, Power Supply, Communication etc.).
Max. recommended tightening torque for the connector screws is 0.5 Nm.
The CT cores of the ***ElNet*** Energy & Power Multimeter are located externally on the rear of the instrument and the lead from the leg of the external Current Transformer must pass through in the correct direction.

**NOTE!**

Ensure all the connections to the leads of the current transformer wiring are secure and there is no mechanical strain on the wire. The cross section of the leads to the current transformer must be compatible to the power of the current transformer. We recommend a power transformer with at least 3VA and the length of the wiring of the transformer no longer than 3m.

Insert the lead from side "**L**" of the Current Transformers of **Line 1** through the bottom of the CT core I1A, (top left looking from back), of the ***ElNet*** Energy & Power Multimeter.

- Ensure the leads from leg **"L**" of the Current Transformer on **Line 1** pass through the bottom of CT core I1A.

- Ensure the other end of the lead emerging from the top of C T core I1A is connected to leg "K" of the Current Transformer on **Line 1**

**WARNING!**

Never allow an open circuit between the two Current Transformers.

Repeat the procedure for **Line 2** and **Line 3.**

Connect the rest of the connections to the ***ElNet*** Energy & Power Multimeter by means of terminal connector plugs. The Rear Panel (See Figure 2.4.) has all connections printed and is simple to follow. (See table 2-1 for connections)

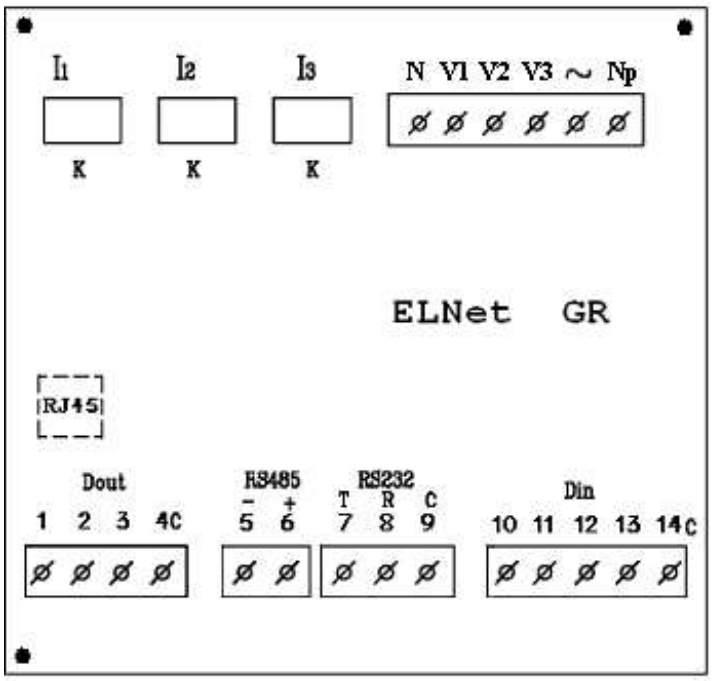



Figure 2.4. **Rear Panel**

| Pin Designation | Description | Remarks |
|---|---|---|
| **V**1 | **Line1** Supplied Voltage | Through a 6Amp fuse |
| **V**2 | **Line2** Supplied Voltage | Through a 6Amp fuse |
| **V**3 | **Line3** Supplied Voltage | Through a 6Amp fuse |
| **N** | Neutral | Measurement neutral Line |
| I1A | From Current Transformer on **Line1** | Note the correct direction to insert the lead |
| I2A | From Current Transformer on **Line2** | Note the correct direction to insert the lead |
| I3A | From Current Transformer on **Line3** | Note the correct direction to insert the lead |
| **~** | Power Supply 110 - 260 VAC | Or 110-260 VDC, external power supply or bridged from phase measurement |
| **Np** | Neutral | Neutral of external power supply |
| Dout | Alarms, see chapter 5.6.1 | |
| Din | Not in use | |

| Pin Designation | Description | Remarks |
|---|---|---|
| RS485 — - | RS485 Comm. (-) Line | |
| RS485 — + | RS485 Comm. (+) Line | |
| RS232 — TXD | RS232 Comm. Transmit | |
| RS232 — RXD | RS232 Comm. Receive | |
| RS232 — COM | RS232 Comm. Common | |
| RJ45 | 10 BASE-T line to Network | Via standard Communications plug |

Table 2-1 **Rear Panel connections**

## 2.5 Manufacturing Data.

Press F1 on the keyboard for 6 seconds. The following screen will appear.

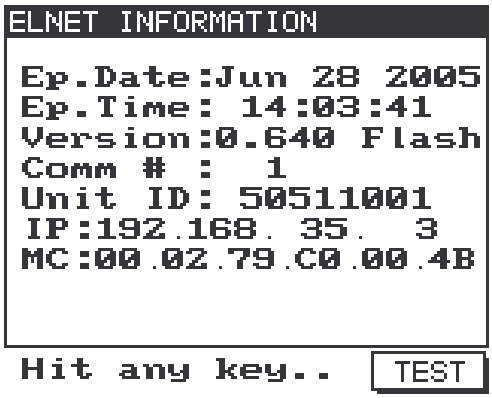



Figure 2.5. **Elnet Information**

| Number | Screen | Description |
|---|---|---|
| 1 | Ep. Date | Production date of software operating system |
| 2 | Ep. Time | No. of times the program has been updated |
| 3 | Version | Program version no. |
| 4 | Comm # | Address of MODBUS Protocol |
| 5 | Unit ID | Consecutive calibration no. |
| 6 | IP | Ethernet/IP address |
| 7 | MC | Ethernet/MAC address |

Table 2-2 **Production Data**

# CHAPTER 3 — USING THE *ElNet* Multimeter

In this chapter you will find descriptions and functions of the front panel and the control buttons and how to use them.

## 3.1 Front Panel

**To operate the front panel**

The Front Panel has a graphic screen and 6 operating buttons.

All the readings are shown on a state of the art 160 X 128 resolution graphic screen and are explained in detail in Chapter 5.

The Control Buttons and their functions are fully explained in Section 3.2.

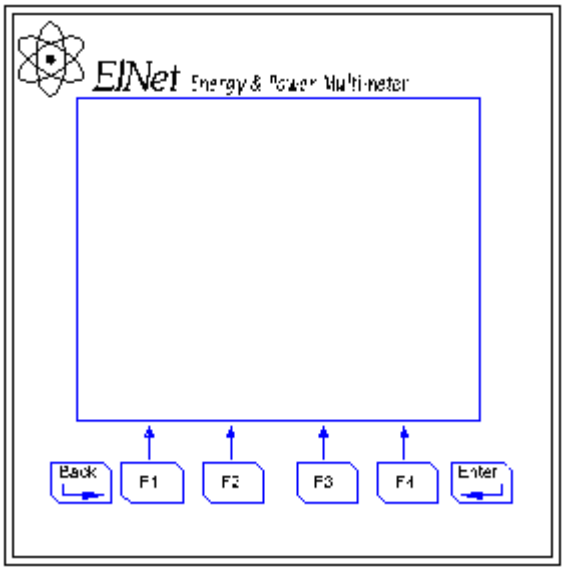



Figure 3.1. **Front Panel**

## 3.2 Control Buttons

**To operate the Control Buttons on Front Panel**

The ***ElNet*** Energy & Power Multimeter has six Control Buttons. With these buttons the ***User*** and ***Senior Electrical Engineer*** can achieve all the functions necessary.

The Control Buttons are arranged on a keypad below the display screen and require slight finger pressure to click.

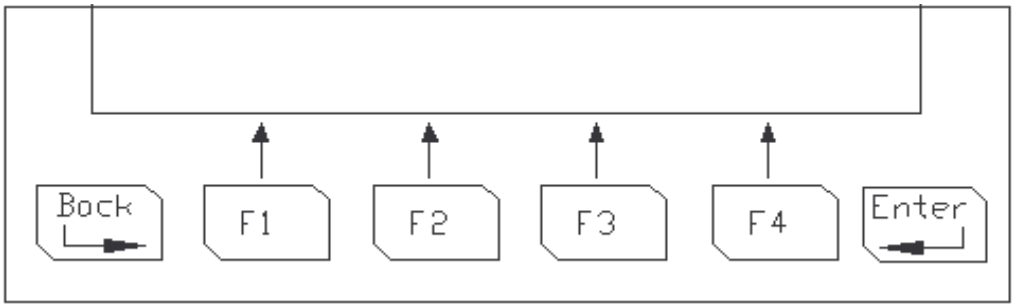
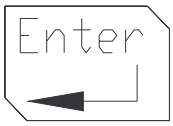
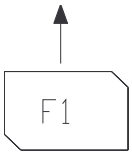
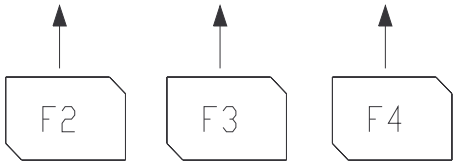



Figure 3.2. **Control Buttons**

| | | |
|---|---|---|
| Button |   | accepts the choice and executes the commands. |

| | | |
|---|---|---|
| Button |   | performs the function that the arrow above is pointing to (e.g. move the curser), or selects the prompt that the arrow is pointing to. |

Buttons 

operate exactly the same as button F1

Button

returns to the previous step or to the Main Menu

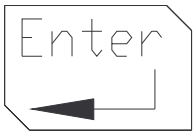
## 3.3 Lock Utility

**To lock and unlock the Control Buttons**

The Control Buttons can be locked against any unauthorized or accidental usage.

**NOTE!**

Only sub menus can be locked. The Lock Utility does not work on the Main Menu.

To Lock press 

for six (6) seconds.

A “Keyboard Locked!” message appears on the screen when any button is pressed.

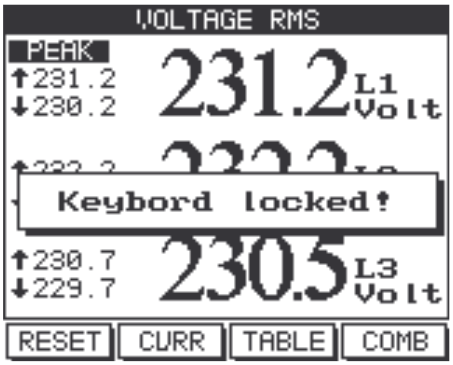
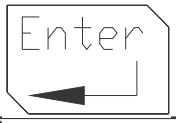



Figure 3.3. **Keyboard locked**

To Unlock simply press 

for six (6) seconds.

A “Keyboard Unlocked!” message appears on the screen and normal functions can resume.

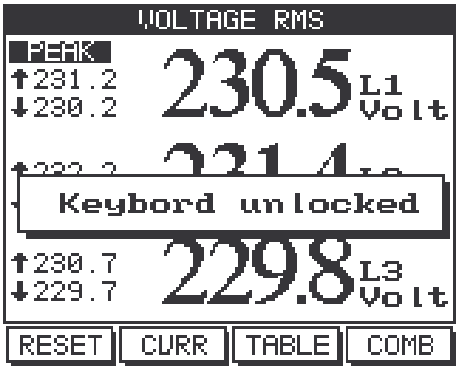



Figure 3.4. **Keyboard Unlocked**

NOTE!

In the event of a general power failure, the ***ElNet GR*** will return to the screen that was showing before the power failure occurred.

# CHAPTER 4 — NECESSARY *ElNet* SETTINGS

In this chapter you will find instructions to set the minimum settings that are necessary to allow the ***ElNet*** Energy & Power Multimeter to function properly.

## WARNING!

- The selection, installation and settings of the Current Transformer are the most vital and fundamental actions required to ensure the accuracy of the ***ElNet*** Energy & Power Multimeter.
- It is essential to know the ratio of the Current Transformer being installed into the system in order to set the parameter for the Current Transformer correctly.
- All three main current Lines MUST have Current Transformers of the same ratio installed onto them.

## 4.1 Settings for Current Transformer

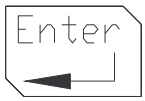
**To set or change settings for Current Transformer**

**NOTE!**

The most important setting necessary for the proper functioning of the ***ElNet*** Energy & Power Multimeter is the Current Transformer setting.

The cross section of the leads to the current Transformer must be compatible to the power of the current transformer. We recommend a power transformer with at least 3VA and the length of the wiring of the transformer no longer than 3m.

1 From Main Menu scroll to **Technical Menu**

2 Click 


The **Check Password** screen appears

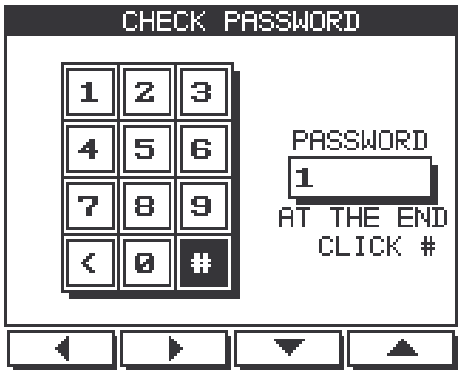
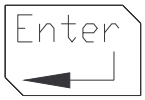



Figure 4.1. **Check Password**

**NOTE!**

The password is 1

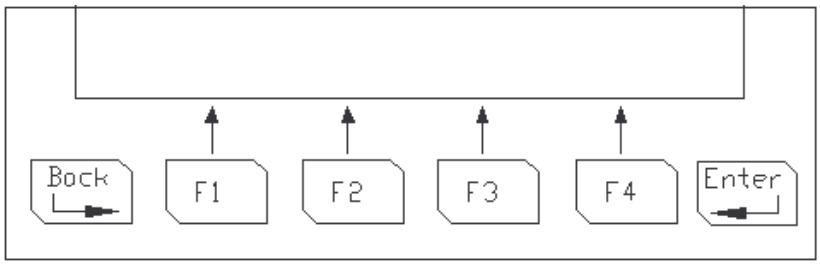
3 Move the cursor with the F1, F2, F3, & F4 buttons to number 1. (See Section 3.2 for description of button functions).

4 Click 


The number 1 will appear in the password field.

Figure 4.2. **Password Field**

5 Move the cursor to the # Sign with F1, F2, F3, & F4 buttons, (See Section 3-2 for description of button functions).




If the incorrect password is inserted into the Password field, an Error message appears

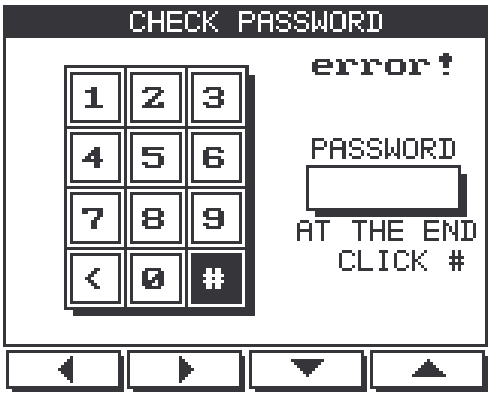
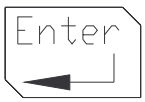



Figure 4.3. **Error Message**

Go back to step 3 and start again.

6 Click 

The **Technical Menu** screen appears

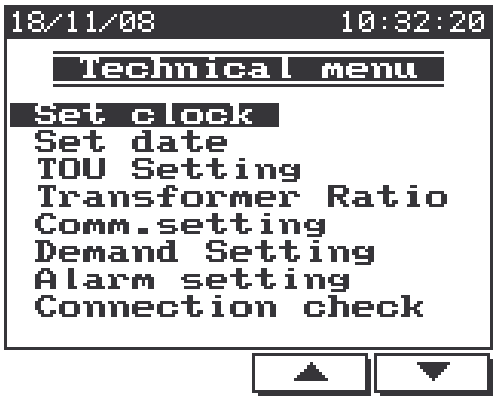
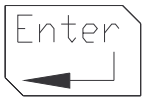



Figure 4.4. **Technical Menu**

7 Scroll to **Current Transformers**

8 Click 


The **Current Transformer** screen appears

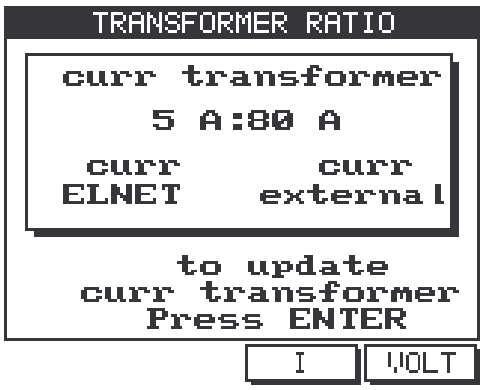
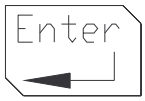



Figure 4.5. **Current Transformer**

The present setting for the **Current Transformer** is shown**.**
If it is a new installation, the ratio will show 5 A:5 A

9 Click 


The **Insert Value** screen appears

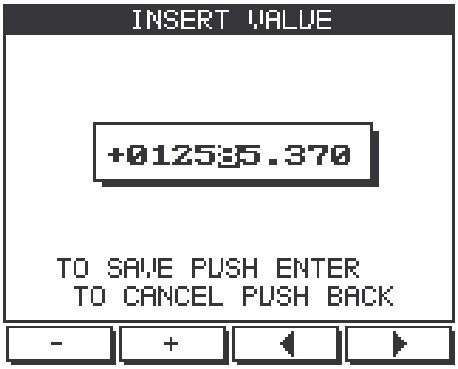
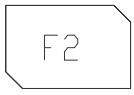
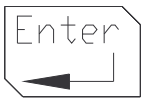



Figure 4.6. **Insert Value**

Use Button **or** to move the cursor.


Use Button **or**  to change the value + or -.


10 To save Click 


11 To cancel Click

## 4.2 Electrical Connection Check

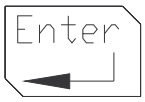
**NOTE!**

To avoid any problems arising from incorrect Voltage Connections or accidental reversal of Current Transformer Connections, it is necessary to perform a Phase Order Check before continuing.

**To perform Electrical connection Check**

See Section 4.1 for instructions to arrive at the **Technical Menu**

1 From Technical Menu scroll to **Connection check**

2 Click 


The **Connection Check** screen appears

CONNECTION CHECK

| | Voltage | Current |
|---|---|---|
| L1 | OK | NO |
| L2 | OK | NO |
| L3 | OK | NO |
| Phase Order= | OK | |

Hit any key..

Figure 4.7. **Connection Check**

Voltage and Current Messages

| Message | Voltage | Current |
|---|---|---|
| **OK** | Voltage "OK" present on Lines. If "OK" is not present on 3 Lines, then its not connected correctly | Current present in Lines and synchronized with Voltage Lines. If "OK" is not present on 3 Lines, then its not connected correctly |
| **OPP** | Not Applicable | Wired in incorrect direction |
| **NO** | No Voltage | No current |

Table 4-1 **Voltage and Current Messages**

Phase Order Messages

| Message | Voltage |
|---|---|
| **OK** | Correct Phase Order of Voltage Connections |
| **OPP** | Incorrect Phase Order i.e. Line 2 does not follow Line 1 and/or Line 1 does not follow Line3 |

Table 4-2 **Phase Order Messages**

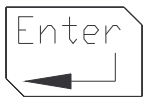
## 4.3 TOU Setting

***ElNet*** Energy & Power Multimeter is capable of working in several TOU Settings. The user can choose the TOU Setting according to the country requested.

**To set TOU**

See Section 4.1 for instructions to arrive at the **Technical Menu**

From Technical Menu scroll to **TOU Setting**

Click 


The **TOU Setting** screen appears

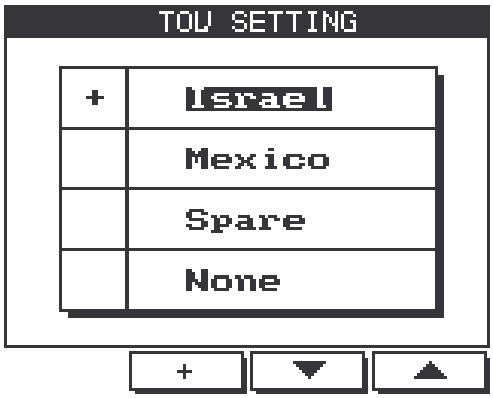



Figure 4.8. **TOU Setting**

Then choose the relevant country by pressing the enter button on its name.

## 4.4 Change language

**To change language on the display screen**

**NOTE!**

The "Change Language Utility" toggles between English and Hebrew and works on the Main screen only.

Click

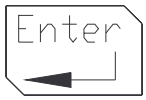
for 6 seconds

## 4.5 Time Settings

**To set Time**

See Section 4.1 for instructions to arrive at the **Technical Menu**

From Technical Menu scroll to **Set Clock**

Click 

The **Set Clock** screen appears

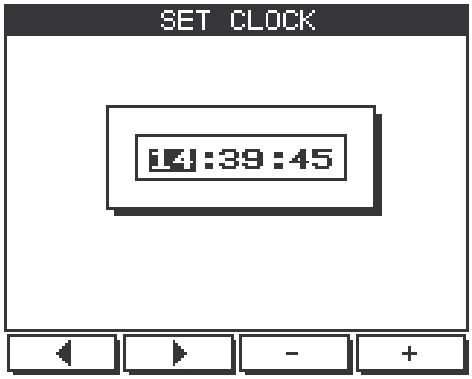



Figure 4.9. **Set Clock**

Use F1 or F2 to select Hour, Minute, Second.

Use F3 or F4 to change time.

Click Back to return to **Technical menu**.

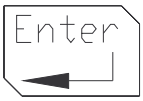
Click Back to return to Main menu.

## 4.6 Date Settings

**To set Date**

See Sectio 4.1 for instructions to arrive at the **Technical Menu**

From Technical Menu scroll to **Set Date**

Click 


The **Set Date** screen appears

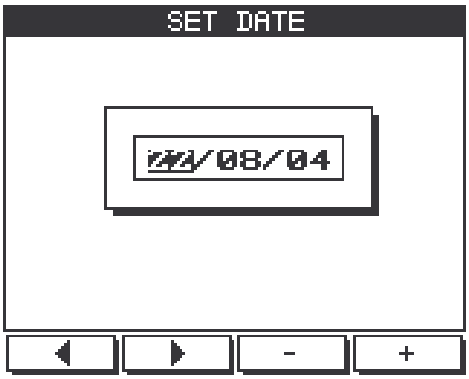



Figure 4.10. **Set Date**

Use F1 or F2 to select Day, Month, Year.

Use F3 or F4 to change Day, Month, Year.

Click

to return to **Technical menu**.

Click

to return to Main menu.

## 4.7 Zero Accumulating Values

**To set all accumulating values to Zero**

1 Repeat step 1 and 2 from Section 4.1.

2 Move the cursor with the F1, F2, F3, & F4 buttons (See Section 3.2 for description of button functions).

3 Insert **6425** into the password field.

4 Click **#**

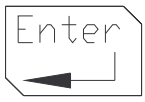
# CHAPTER 5 — FRONT PANEL DISPLAYS

In this chapter you will find instructions on how to obtain the readings that the ***ElNet*** Energy & Power Multimeter provides, e.g., Current, Voltage Power, Power Factor, Energy, and Power quality.

## 5.1 Current for 3 Phases

**To display Current for all 3 Phases**

1 From Main Menu scroll to **Current & Voltage**

2 Click 


The **Current** screen appears

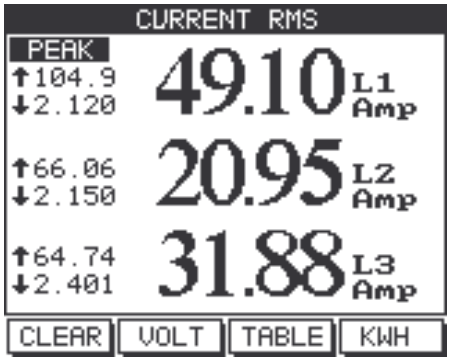



Figure 5.1. **Current Display**

3 Read the **Current for Line1, Line2 and Line3**

## 5.2 Frequency for 3 Phases

**To display Frequency for all 3 Phases**

1 Display the current screen as described in section 5.1

2 Click

" TABLE"

3 Click

" FREQ"

The **Frequency** screen appears

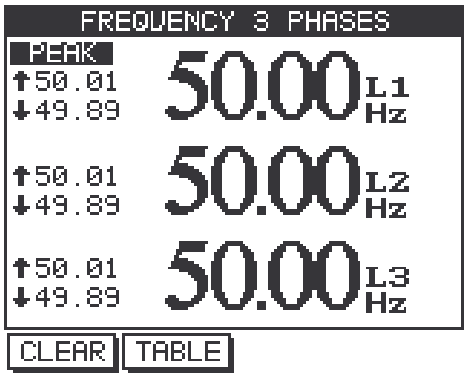



Figure 5.2. **Frequency for all 3 Phases**

You can reset the Peak values by using the "CLEAR" button

Read the **Frequency** in Line 1, Line 2, Line3

## 5.3 Current in Neutral Line

By using the Vector value of L1/2/3 **Current** ***ElNet*** Energy & Power Multimeter calculates the Current in the **Neutral Line**.

**To display Current in the Neutral Line**

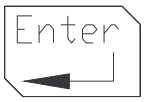
**NOTE!**

If the reading for neutral line is "0" (i.e. there is no current in the neutral line), then either there is no current in system,

OR

the current for all three phases is balanced.

1 From Main Menu scroll to **Current & Voltage**

2 Click 


3 The **Current & Voltage** screen appears as described in section 5.1

4 Click

- " TABLE"

5 The **Current & Voltage** table screen appears

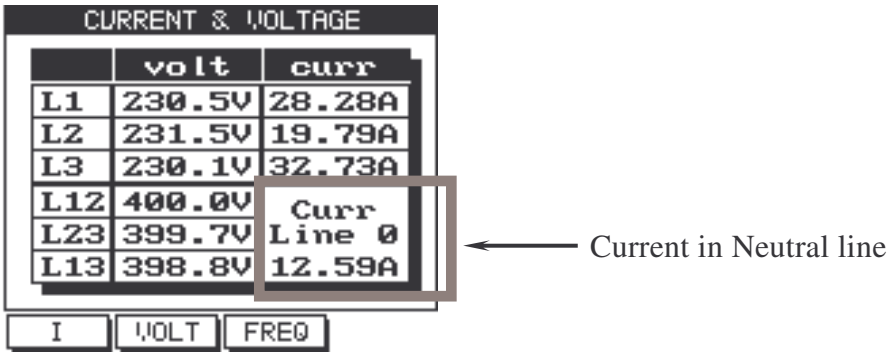



Figure 5.3. **Combined Displays**

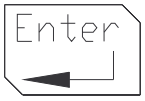
| Parameter | Description | Units |
|---|---|---|
| L1 | Voltage from **Line1** to Neutral | Volts |
| L2 | Voltage from **Line2** to Neutral | Volts |
| L3 | Voltage from **Line3** to Neutral | Volts |
| L12 | Voltage across **Line1** and **Line2** | Volts |
| L23 | Voltage across **Line2** and **Line3** | Volts |
| L13 | Voltage across **Line1** and **Line3** | Volts |

Table 5-1 **Voltage Readings**

## 5.4 Voltage for 3 Phases

**To display Voltage for all 3 Phases and across Phases**

1 From the Main Menu scroll to **Current & Voltage**

2 Click 


The **Current & Voltage** screen appears

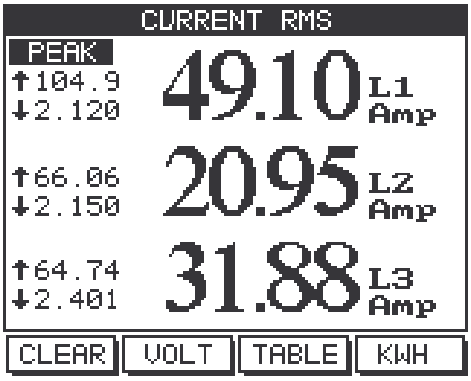



Figure 5.4. **Combined Displays**

3 Click “VOLT”


The **Voltage** screen appears

## 5.5 Active Power for all 3 Phases (P)

**To display Active Power for all 3 phases**

1 From Main Menu scroll to **Power Display**

2 Click


The **Active Power** screen appears

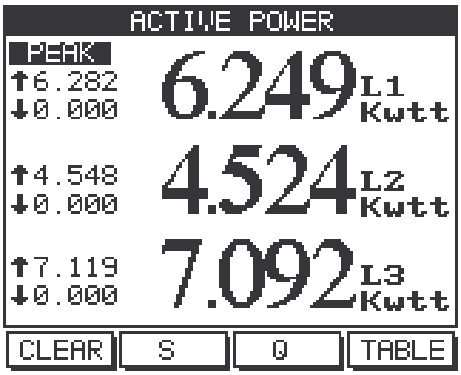



Figure 5.5. **Active power**

3 Click

To display **Power Table**

| Parameter | Description | Unit |
|---|---|---|
| P | Active Power for each Line | Watts |
| Q | Reactive Power for each Line | VAR |
| S | Apparent Power for each Line | VA |
| Σ P | Total Active Power for all 3 Lines | Watts |
| Σ Q | Total Reactive Power for all 3 Lines | VAR |
| Σ S | Total Apparent Power for all 3 Lines | VA |
| PF | Power Factor | |

Table 5-2 **Power Readings**

**NOTE!**

Peak ↑ is the highest value reached for the adjacent reading since the ***ElNet*** Energy & Power Multimeter was first switched on,

**OR**

Since the last time the reset button was pressed.

Peak ↓ is the lowest value reached for the adjacent reading since the ***ElNet*** Energy & Power Multimeter was first switched on,

**OR**

Since the last time the reset button was pressed.

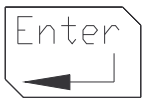
**NOTE!**

The "CLEAR" button resets the Peak values only for the screen presently being shown.

## 5.6 Reactive Power for all 3 Phases (Q)

**To display Reactive Power for all 3 phases**

1 From Main Menu scroll to **Power Display**

2 Click 


The **Power Table** screen appears

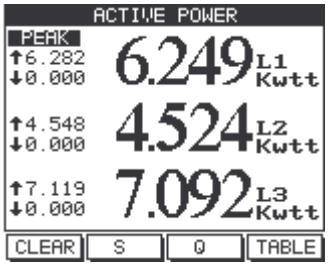
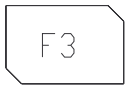



Figure 5.6. **Active Power**

**To display Reactive Power for all 3 phases in a single screen**

3 Click 


The **Reactive Power** screen appears

Refer to section 5.4 for description of peaks. The "CLEAR" button resets the Peak values

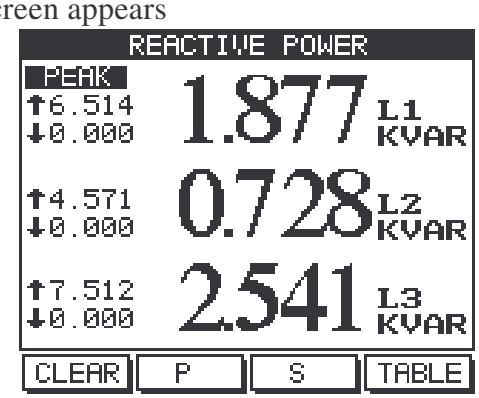
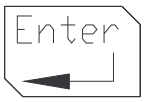



Figure 5.7. **Reactive Power**

## 5.7 Apparent Power for all 3 Phases (S)

**To display Apparent Power for all 3 phases**

1 From Main Menu scroll to **Power Display**

2 Click 


The **Power Table** screen appears

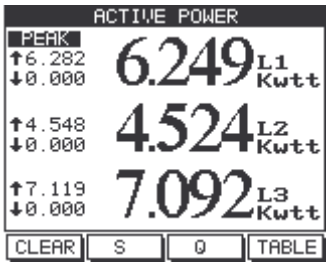



Figure 5.8. **Power Table**

**To display Apparent Power for all 3 phases in a single screen**

3 Click


Refer to section 5.4 for description of peaks. The “CLEAR” button resets the Peak values

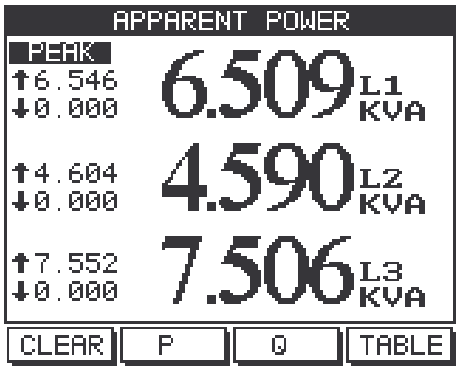



Figure 5.9. **Apparent Power**

## 5.8 Power Factor for each Phase

**To display Power Factor for each phase**

1 From Main Menu scroll to **Power Display**

2 Click


3 Click

to display “TABLE” format

The **Power Table** screen appears

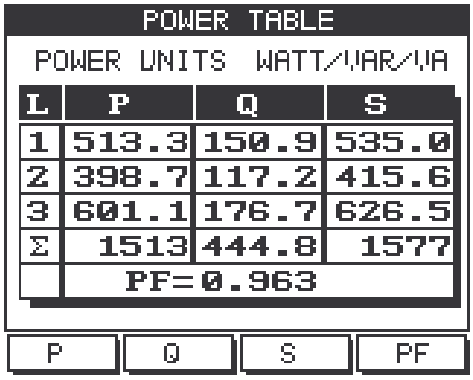



Figure 5.10. **Power Table**

4 Click F4

The **Power Factor for each Line** screen appears

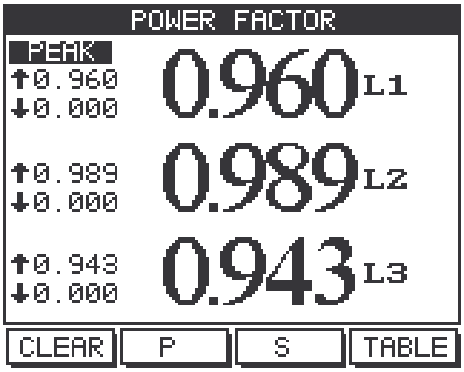



Figure 5.11. **Power Factor for each line**

## 5.9 Overall Power Factor

**To display Overall Power Factor**

1 From Main Menu scroll to **Power Display**

2 Click Enter and then click F4

The **Power Table** screen appears

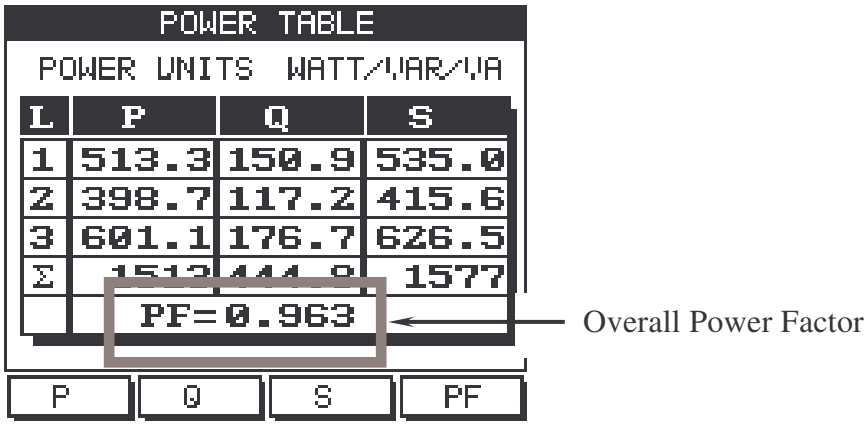



Figure 5.12. **Power Table**

## 5.10 Active Energy

**To display Overall Active Energy**

1 From Main Menu scroll to **Energy Display**

2 Click


The **Energy Meter** screen appears

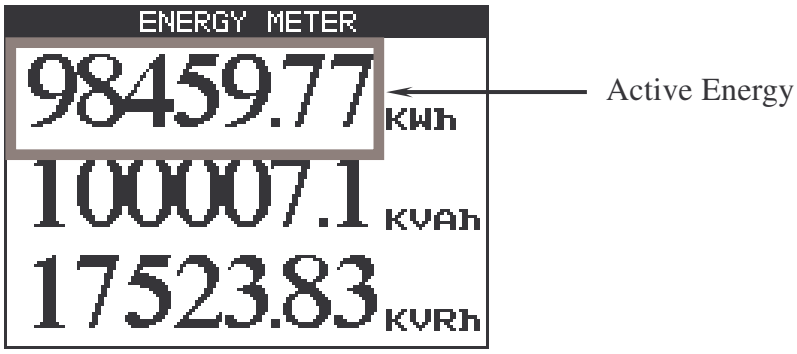



Figure 5.13. **Energy Meter**

3 Read the **Active Energy for Line1, Line2, Line3**

**To return to Main Menu**

To return to Main Menu click


## 5.11 Reactive Energy

**To display Overall Reactive Energy**

1 From Main Menu scroll to **Energy Display**

Click


The **Energy Meter** screen appears

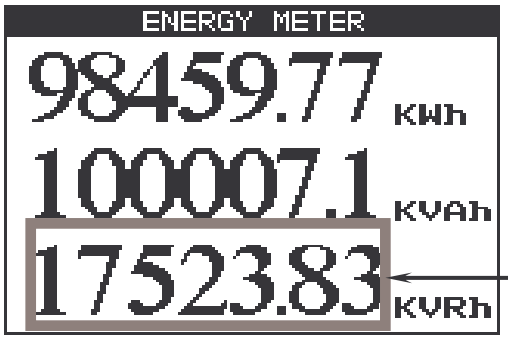



Figure 5.14. **Energy Meter**

2 Read the Reactive Energy for Line1, Line2, Line3

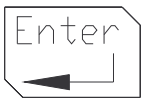
**To return to Main Menu**

3 To return to Main Menu click

## 5.12 Apparent Energy

**To display Overall Apparent Energy**

1 From Main Menu scroll to **Energy Display**

2 Click 


The **Energy Meter** screen appears

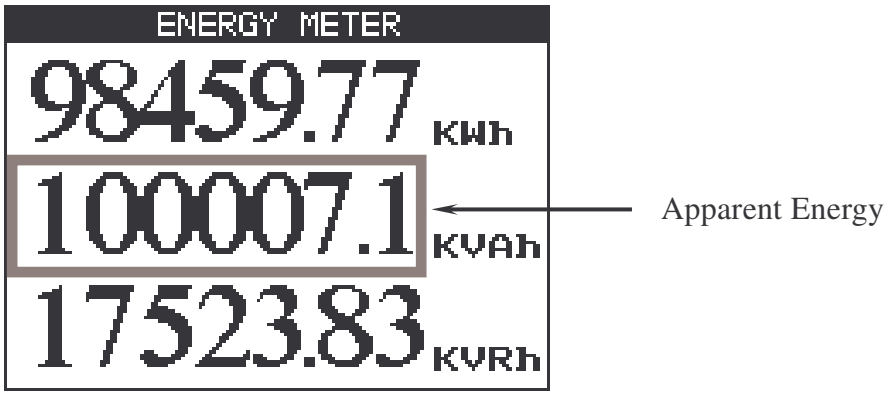



Figure 5.15. **Energy Meter**

3 Read the Apparent Energy for Line1, Line2, Line3

**To return to Main Menu**

4 To return to Main Menu Click

## 5.13 Power Quality

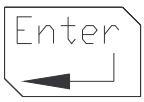
**NOTE!**

Poor Harmonics could invoke a fine and damage to the electrical system and can be improved by adding filters.

The ***ElNet*** Energy & Power Multimeter **GRAPHIC** Model is capable of displaying Harmonics in **Wave Form Graph, Harmonics Bar Graph, Harmonic Table**s and **Total Harmonic Distortion** for Voltage and Current.

### 5.13 .1 Wave Form Graphs

**To display Wave Form Graphs**

1. From Main Menu scroll to Power Quality
2. Click 


The **Power Quality** screen appears

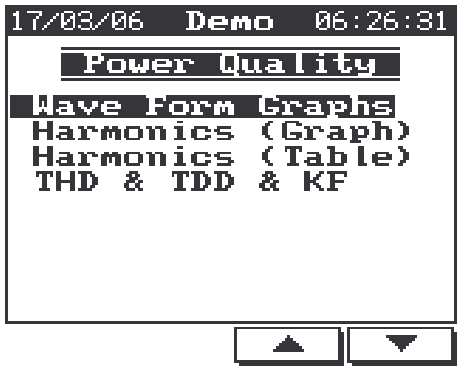
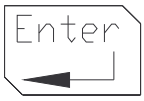



Figure 5.16. **Power Quality**

3. Scroll to **Wave Form Graphs**

4. Click 


The **Wave Form Graphs** screens appear.

**NOTE!**

Available **Wave Form Graphs**

| | | |
|---|---|---|
| 1. | **Volts** | Line 1, Line 2 and Line 3 |
| 2. | **Current** | Line 1, Line 2 and Line 3 |
| 3. | **Active Power** | Line 1, Line 2 and Line 3 |
| 4. | **Reactive Power** | Line 1, Line 2 and Line 3 |
| 5. | **Apparent Power** | Line 1, Line 2 and Line 3 |

**To display Voltage Wave Form Graphs**

1. Click


The **Voltage Graph** screens appears

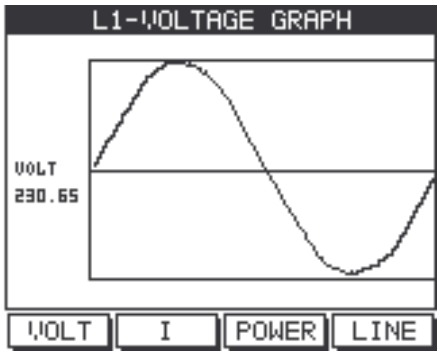



Figure 5.17. **Voltage Graph**

2. Press F4 to change **Voltage Graph** to Line 1, Line 2 and Line 3

**To display Current Wave Form Graphs**

1. Click F2

The **Current Graph** screens appears

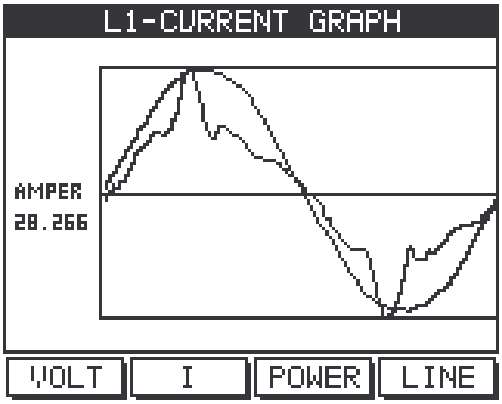



Figure 5.18.**Current Graph**

2. Press F4 to change **Current Graph** to Line 1, Line 2 and Line 3

**To display Active Power Wave Form Graphs**

1. Click F3

The **Active Power Graph** screens appears

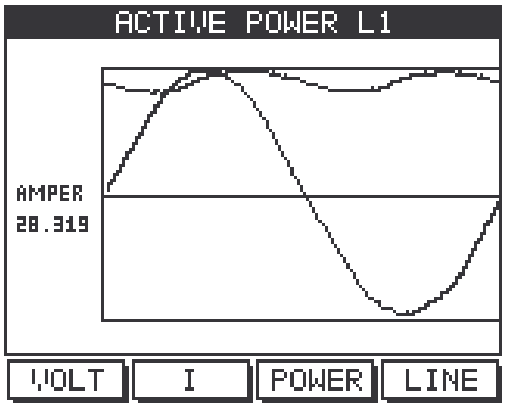



Figure 5.19. **Active Power Graph**

2. Press F4 to change **Active Power Graph** to Line 1, Line 2 and Line 3

**To display Reactive Power Wave Form Graphs**

1. Click F3

The **Reactive Power Graph** screens appears

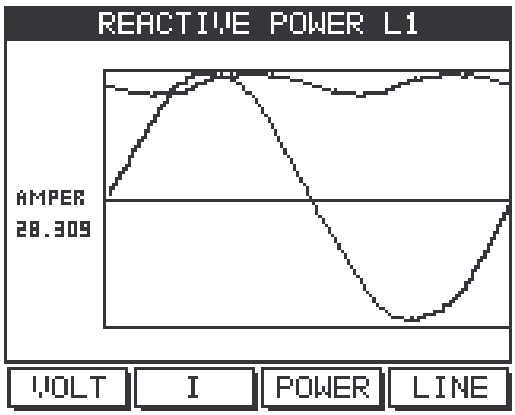



Figure 5.20. **Reactive Power Graph**

2. Press F4 to change **Reactive Power Graph** to Line 1, Line 2 and Line 3

**To display Apparent Power Wave Form Graphs**

1. Click F3

   The **Apparent Power Graph** screens appears

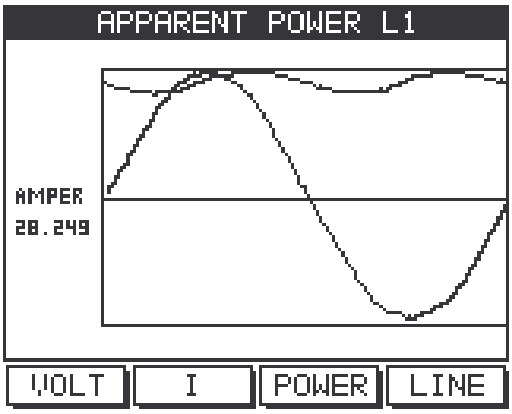



Figure 5.21. **Apparent Power Graph**

2. Press F4 to change **Apparent Power Graph** to Line 1, Line 2 and Line 3

## 5.13 .2 Harmonics Bar Graphs

**To display Harmonics Bar Graphs**

1. From Main Menu scroll to **Power Quality** Display
2. Click Enter

The **Power Quality** screens appears

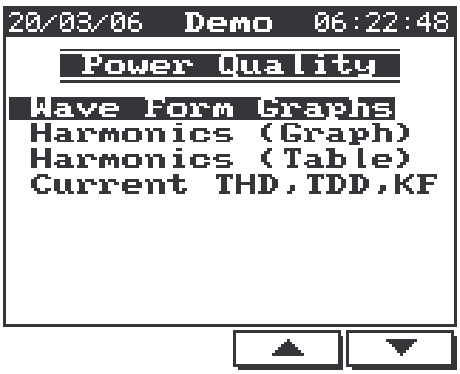



Figure 5.22. **Power Quality**

3. Scroll to **Harmonic (Graphs)**

4. Click


The **Harmonics Volt Bar Graph** screens appears

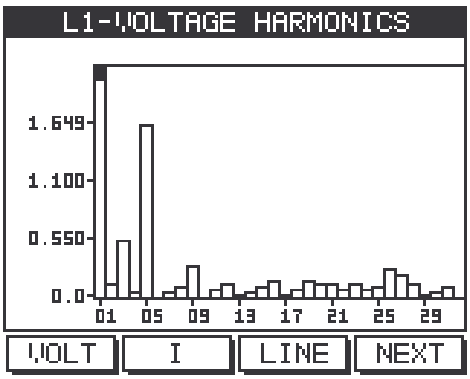



Figure 5.23. **Harmonics Bar Graph**

5. Press F3 to change **Harmonics Volts Bar Graph** to Line 1, Line 2 and Line 3

**NOTE!**

1st Harmonics is normally 100%. If shown together with the other Harmonics, distortion to the rest of the Harmonic Bar Graph will occur. By toggling F4, the ***ElNet*** Energy & Power Multimeter are able to separate 1st Harmonics to prevent this distortion.

**To display Harmonics Current Bar Graph**

Click F2

The **Harmonic Current Bar Graph** screens appears

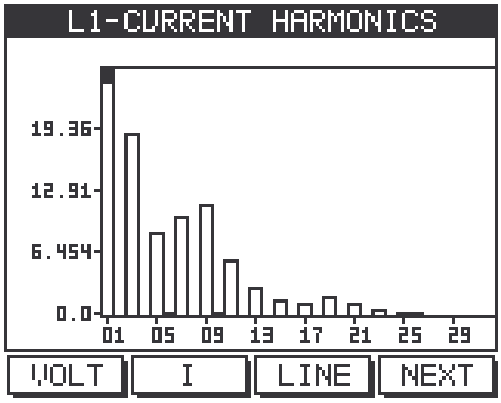


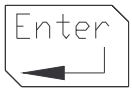

Figure 5.24. **Harmonic Current Bar Graph**

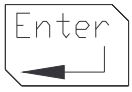
## 5.13 .3 Voltage Total Harmonic Distortion (THD)

**NOTE!**

The ***ElNet*** Energy & Power Multimeter is capable of measuring Voltage and Current Harmonic Distortion for the first 60th Harmonics. These are presented in a table format with the Total Harmonics Distortion (THD) also shown.

**To display Harmonics Tables**

1. From Main Menu scroll to **Power Quality** Display
2. Click 

3. Scroll to **Harmonic (Table)**
4. Click 

The **Harmonics Volt Table** screens appears

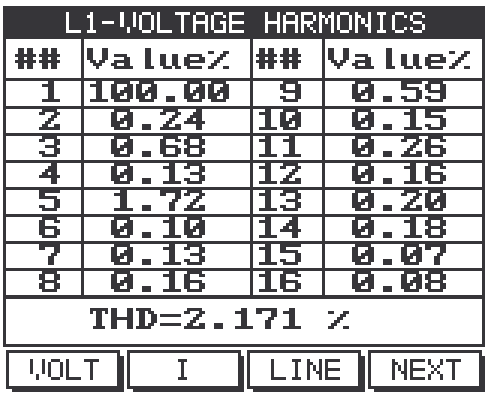



Figure 5.25. **Harmonic Volt Table**

5. Click

to scroll down the Table to observe all Volt Harmonics till 60th

6. Click

to change **Harmonics Volt Table** to Line 1, Line 2 and Line 3

## 5.13 .4 Current Total Harmonic Distortion (THD)

**To display Harmonics Current Table**

Repeat steps 1-4 from Section 5.13.3

1. Click F2

The **Harmonic Current Table** screens appears

| L1-CURRENT HARMONICS | | | |
|---|---|---|---|
| ## | Value% | ## | Value% |
| 1 | 100.00 | 9 | 11.70 |
| 2 | 0.21 | 10 | 0.31 |
| 3 | 19.30 | 11 | 6.12 |
| 4 | 0.19 | 12 | 0.20 |
| 5 | 8.84 | 13 | 3.07 |
| 6 | 0.44 | 14 | 0.09 |
| 7 | 10.31 | 15 | 1.64 |
| 8 | 0.23 | 16 | 0.06 |
| THD=27.5% Kf=1.8 | | | |
| VOLT | I | LINE | NEXT |

Figure 5.26. **Harmonic Current Table**

2. Click F4 to scroll down the Table to observe all the Current Harmonics till 60th

3. Click F3 to change **Harmonics Current Table** to Line 1, Line 2 and Line 3

## 5.13 .5 Current THD,TDD,KF

From Main Menu scroll to Power Quality Display and then scroll to THD, TDD, KF Current.
The **Current, THD, TDD, KF** Table screens appears

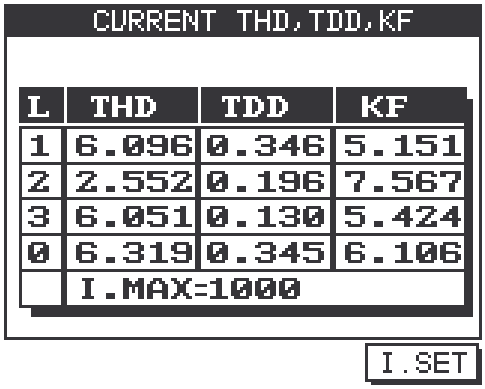



Figure 5.27. **Current THD, TDD, KF**

In order to enable the system to calculate properly the TDD value, user should set the max line current value by using “F4”.

# CHAPTER 6 — ALARM REPORT

Every second automatically the ***ElNet*** monitor all the electrical values and compare them to the pre-setting alarm values.

The ***ElNet*** can handle and store up to1,000 alarms that are stored in the ***ElNet*** memory with their time & date data.

The ***ElNet*** has three alarm relays each one of them can be linked to one or more pre-defined alarms.

The following alarms can be defined:

| | Lines |
|---|---|
| 1. Voltage alarms | L1; L2; L3 |
| 2. Current alarms | L1; L2; L3 + neutral line |
| 3. Power factor alarms | L1; L2; L3 +General |
| 4. Harmonics alarms | L1; L2; L3; L0 |
| 5. PEAK & SAG alarms | L1; L2; L3 |

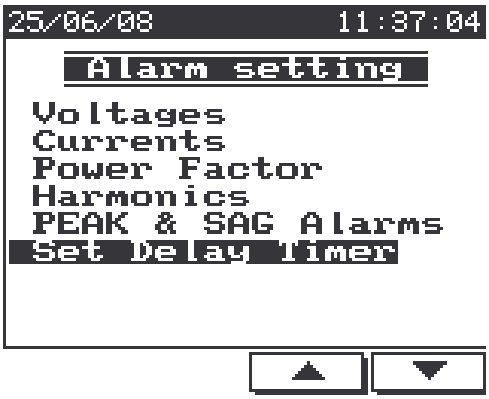



Figure 6.1. **Alarm Setting**

For each one of the above alarms the user can define two alarms - low value alarm and high value alarm.

The user can select one of sixteen different timers in order to delay each one of the alarms.

### 6.1.1. Alarm setting

See chapter No. 4.1 how to get in the **Technical Menu** from the main screen.

From the **Technical Menu** select **"Alarm setting"** and press Enter. The **Alarm Setting Screens** appear. (See figure 6.1).

From this screen you will be able to set alarms for Voltages, Currents Power Factor, Harmonics, PEAK& SAG alarms and to set the values for 16 delay timers that can be linked to each one of the alarms.

**For each alarm the user can define:**

**High alarm** – The set point that above that the alarm will be generated.

**Low alarm** – The set point that below that the alarm will be generated.

**Delay timer –** One of sixteen timers that define the time duration that the alarm should be "ON" in order to be written in the memory.

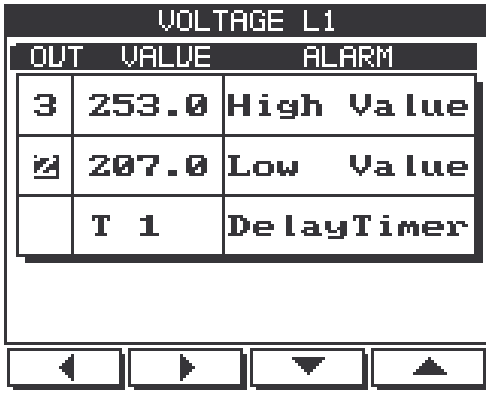



Figure 6.2. **Alarm user defines**

**Set Delay Timers:**

Up to sixteen delay timers can be defined in the ***ElNet*** Multimeter, user can link for each one of the timer one or more alarms, the delay timer will check that the alarm is stable and will not write the alarm in the memory of the ***ElNet*** unless the alarm is in "ON" position for the time duration as set.

In order to set the time duration for the sixteen timers select "**Set Delay Timer"** form the screen described in Figure 6.1. **Alarm Setting Screens** the following screen appears.

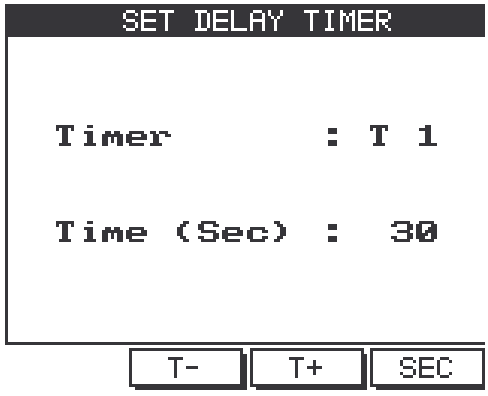



Figure 6.3. **Timer Delay**

By using **"T- / T+ "** (F2 / F3) the timer number can be changed.

By using "SEC " (F4) the time delay value can be changed.

## 6.1.2. Display Alarms Report

Two alarm reports can be generated:

Historical alarm report – includes all the information about fixed alarms (return to normal status).

Current alarm report - includes all the information about existing alarms.

In order to generate an alarm report, from the Main Menu scroll to "**Alarm report** " and press enter, scroll to " Historical Repot or Current report " and select one of them by using ( F3/F4) and press enter. A list of alrms appear – Press "INFO" (F1) in order to get detailed information. The following screen will appear:

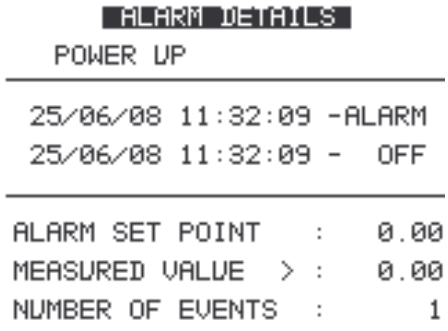



Figure 6.4. **Alarm Details**

# CHAPTER 7 — DEMAND REPORTS

***ElNet*** Multimeter can generate reports that will inform the user the date of the maximum demand. The reports include:

*Maximum Demand* – for active power and power factor.

*Maximum Demand* –for reactive power and power factor.

*Maximum Demand* – for apparent power and power factor.

*Maximum Demand* – for current and voltage.

The ***ElNet*** *informs* the value of the demand and the relevant power factor, the time. The date, for all three phases, the demand is the maximum value within the predefine time interval specified by the user.

Press F1 in order to select I / PF - Current / power factor maximum Demand

Press F2 in order to select P / Q / S active / reactive / apparent power Demand

Press F4 n order to see the power factor together with the power demand

Press F3 “DATE” in order to change the time interval within which the ***ElNet*** will check the maximum demand.

# CHAPTER 8 — DATA LOGGING

***ElNet*** multimeter collects automatically important electrical data day by day, for approximately two years.

From the Main Menu scroll to "**Data Logging** " and press Enter. The following screen appears

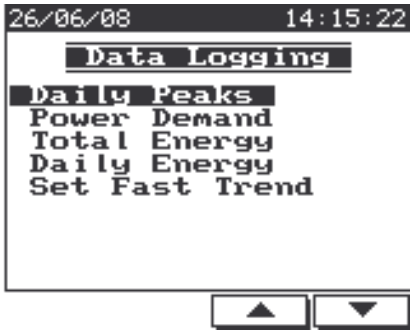



Figure 8.1. **Data Logging**

**Daily peaks :**

Select Daily peaks and press Enter, then you will be able to get the following information:

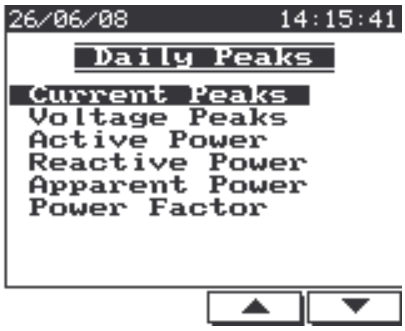



Figure 8.2. **Daily Peaks**

For each one of the above options you will have the ability to get for each phase the lowest-level value and the highest-level value as specified in the following screen:

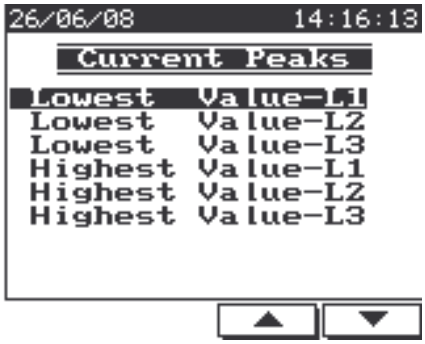



Figure 8.3. **Current Peaks**

Select one of the above options and press Enter, the following screen will appear:

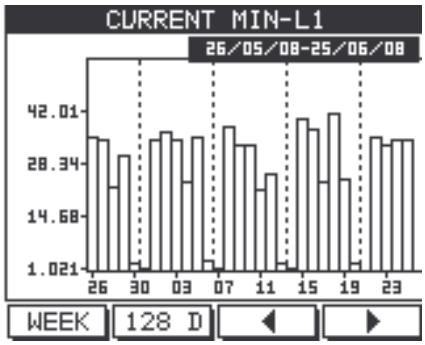



Figure 8.4. **Current Min. L1**

F1 / F2 – change the interval - time base between week / month / 128 days

F3 /F4 – change the date, each press will increase / decrease the date by week / month / 128 days.

**Power Demand :**

The operation metod is very similar to the above paragraph “Daily peaks” and the informatin includes the maximum average for 15 minutes of the active power, reactive power and apparent power demand.

**Total Energy :**

The operation metod is very similar to the above paragraph “Daily peaks” and the informatin includes the toatl energy values for active energy, reactive energy and apparent energy for each phase and total energy.

**Daily Energy :**

The operation metod is very similar to the above pragraph “Daily peaks” and the informatin daily energy consumption for active energy, reactive energy and apparent energy for each phase and total energy.

**Set Fast Trend :**

Selecting **Data logging** form the screen described in Figure 8.1. will enable you to set a trend report. The size of the trend report is 4200 samples of all the measurements (currents, voltages, power, power factor and more for all phases).

The user can set only the cycle time (sampling rate) and the range is from one second up to 3600 seconds (one hour)

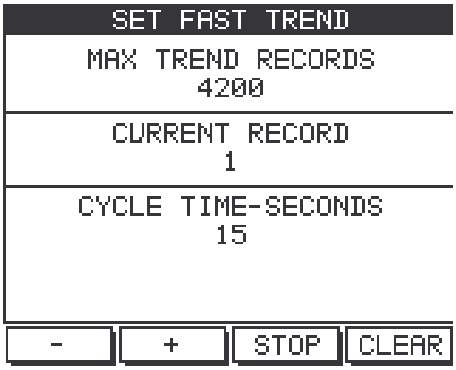



Figure 8.5. **Set Fast Trend**

# CHAPTER 9 — COMMUNICATION

## 9.1 Communication Connections

The ***ElNet*** Energy & Power Multimeter supports RS232 and RS485. Connections for both are provided on the Rear Panel, (see Figure 6.1) and are made by means of the connectors provided. The same information can be transmitted along both, but only one at a time. The user can choose the one that best suits his current situation and equipment.

The 10 BASE-T sockets support a standard connection to any Ethernet network.

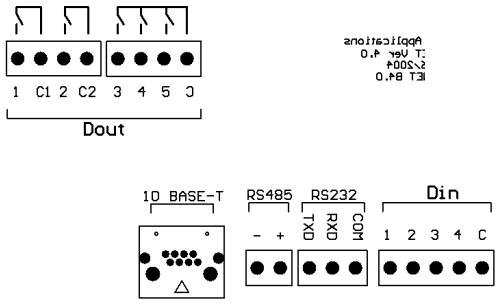



Figure 9.1. **Communication Connections**

## 9.2 Communication Settings

To enable the ***User*** connecting the ***ElNet*** Energy & Power Multimeter to a PC **master** computer for successful communications, the Communication Setup parameters of both must match; i.e. the port of the PC **master** and the configuration settings of the Power meter.

## 9.3 Address

Each Power meter in a communication system must have its own unique address.

Since the ***ElNet*** Energy & Power Multimeter works on MODBUS, the available addresses are from '1' to '247'.

## 9.4 Baud Rate

The Baud Rate is the communication speed in Bits per second (BPS) that the ***ElNet*** Energy & Power Multimeter communicates with the PC **master**. The better the communication line Quality, the faster the communications may be.

If the communication line is routed through a "noisy" environment, it may be necessary to decrease the Baud Rate.

Available Baud Rates for the ***ElNet*** Energy & Power Multimeter:

| | |
|---|---|
| 600 | bps |
| 1200 | bps |
| 2400 | bps |
| 4800 | bps |
| 9600 | bps |
| 19200 | bps |

## 9.5 Parity

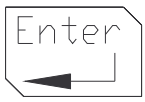
The choices of parity are either NONE or EVEN (see section 6.1.1 for description of Parity).

## 9.6 Communication Set Up

**To set up Serial Communications**

See Section 4.1 for instructions to arrive at the Technical Menu.

From Technical Menu scroll to **Communication Settings**

1 Click 


The **Communication Setup** screen appears

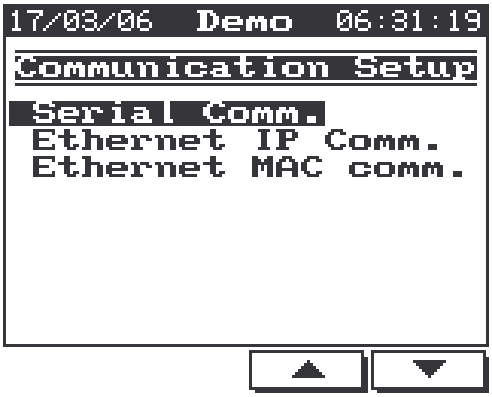
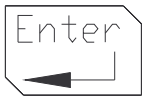



Figure 9.2. **Communication Setup**

From Communication Setup Menu scroll to **Serial Comm.**

2 Click 


The **Communications Settings** screen appears

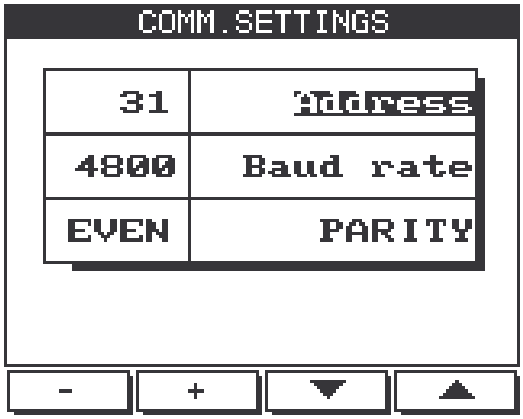
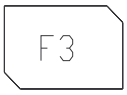



Figure 9.3. **Communications Settings**

Use Button  **or** to select Address, Baud Rate, Parity



Use Button **or** to change value in selected field

**NOTE!**

When the selection is made it takes immediate affect with no further action required.

Click

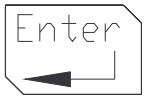
to return to Technical menu.

Click

to return to Main menu.

**To set up Ethernet Communications**

From the Communication Setup Menu scroll to **Ethernet Comm**.

1 Click 

The **Set IP Address** screen appears

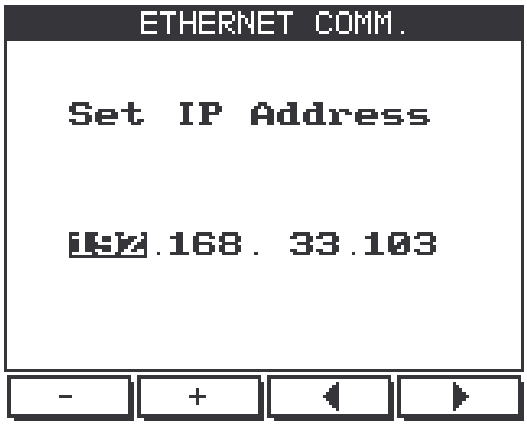



Figure 9.4. **Set IP Address**

Use Button F3 **or** F4 to move the cursor

Use Button F1 **or** F2 to change IP Address

## 9.7 Communication with UniArt Software

CONTROL APPLICATIONS Ltd propriety software, "UniArt" is used to **Read** and **Write** Registers of the ***ElNet*** Energy & Power Multimeter. Each Item number in the Registers Table is a unique field containing information. The UniArt software manages each Item number as a parameter.
Refer to the UniArt manual how to set up parameters.

**To read fields using UniArt**

1 Find the reading required in the MODBUS Registers Table

2 Note the Item Number from the Registers Table

3 Go to the correct File number

Because File capacity in UniArt is limited to 128 parameters, the information contained in the ***ElNet*** fields is stored in several files.

File number is determined by the Item number

| | | |
|---|---|---|
| File # 0 contains | Item number | 1 - 128 |
| File # 1 contains | Item number | 129 – 256 |
| File # 2 contains | Item number | 257 – 384 |
| File # 3 contains | Item number | 385 – 512 |

4 Go to the correct Point number within that file

Point number is determined by the formula:

Item number – [FILE X 128] = Point Number

E.G. 1 If the user the wishes to read Voltage Line 2 (Item No 2)
By applying the formula: 2 - [0 X 128] = 2
File = 0 and Point within that file = 2

E.G. 2 If the user the wishes to read 30th Harmonics for Volts Line1 (Item No 330)
By applying the formula: 330 - [2 X 128] = 74
File = 2 and Point within that file = 74

E.G. 3 If the user the wishes to read 7th Harmonic for Current Line 3 (Item No 467)
By applying the formula: 467 - [3 X 128] = 83
File = 3 and Point number within that file = 83

More Examples

| E.G. No | Item No | Field Description | File | Point |
|---|---|---|---|---|
| 1 | 2 | Voltage Line 2 | 0 | 2 |
| 2 | 330 | 30th Harmonics for Volts Line1 | 2 | 74 |
| 3 | 467 | 7th Harmonic for Current Line 3 | 3 | 83 |
| 4 | 128 | | 0 | 128 |
| 5 | 129 | | 1 | 1 |
| 6 | 256 | | 1 | 128 |
| 7 | 257 | | 2 | 1 |
| 8 | 384 | 20th Harmonics for Volts Line 3 | 2 | 128 |
| 9 | 385 | 21st Harmonics for Volts Line3 | 3 | 1 |

Table 6-6 **Examples how to calculate Point for UniArt**

# CHAPTER 10 — Specifications

| Item | Description |
|---|---|
| Power requirements | 110/230VAC,60/50 Hz, 30VA |
| Dimensions | (HxWxD) 144x144x100 mm |
| Shipping Weight | 750 gr. |
| Measuring voltage limits | 700 VAC |
| Measuring current limits | 6 A |
| Operating Voltage limits | 1000VAC |
| Operating Current limits | 50A |
| Enclosure material | ABS Anti flame |
| Display | Graphic 160x128 |
| Operating temperature | -20 - + 50 C |
| Storage temperature | -20 - + 80 C |
| Humidity | 0- 90 RH% |
| Voltage input terminals | VL – E10 1708 |
| Communication port | RS232/ RS485/ 10 BASE -T |
| Mounting | Front Panel Mounting |

All technical specifications are subject to change without notice.

# Appendix A — Installation & Configuration Check List

## INSTALLATION CHECK LIST

| Description | Date | Signature |
|---|---|---|
| Check contents of packaging | | |
| Remove from packaging | | |
| Prepare hole | | |
| Mount Multimeter | | |
| Connect Multimeter power supply | | |
| Connect 3 Current Transformers | | |
| Connect 3 Voltage lines | | |
| Connect Neutral line | | |
| Set Current Transformer Ratio | | |
| Connect Communication lines | | |
| Check Phase Order Connections | | |
| Set Time and Date | | |

Appendix A Table - Installation & Configuration Check List